

Application of an electronic nose to differentiate extra virgin olive oils according to the geographical origin: Côa versus Douro regions

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Introduction and objectives

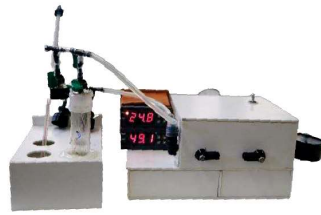


- Olive oils produced in the Douro's region (north of Portugal) are greatly appreciated due to their specific chemical-sensory characteristics, which can be associated to the region's "Terroir".
- The capability to guarantee the authenticity of the geographical origin of these oils is of most importance.
- This study aimed to apply an electronic nose (E-nose), with nine metal oxide semiconductors (MOS) sensors, as a non-invasive analytical tool to identify the geographical origin of olive oils from two geographical sub-regions: "Côa" and "Douro".

Material and methods



Samples



E-nose device



Sensory analysis

Free acidity

Peroxides value

Extinction coefficients

Chemical quality

Results and discussion

- ✓ 31 oils from "Douro" and 36 oils from "Côa" sub-regions were studied.
- ✓ 23 sensory attributes were perceived in the majority of the oils:
 - 9 olfactory attributes : fruity – green or ripe; apple; banana; tomato and tomato leaves; dry fruits; cabbage; fresh and dry herbs
 - 14 gustatory attributes: sweet; bitter; pungent; fruity – green or ripe; apple; banana; tomato and tomato leaves; dry fruits; cabbage; fresh and dry herbs; plum; olive leaves
- ✓ "Douro" oils were sweeter and had greater intensities of fruity-ripe, banana and dry herbs sensations
- ✓ "Côa" oils were more bitter and pungent showing higher intensities of fruity-green, tomato and tomato leaves, cabbage, fresh herbs and olive leaves sensations
- ✓ The E-nose coupled with PCA was capable to differentiate the two oils' geographical origins.



Figure 1 – Côa olive oil's attributes.

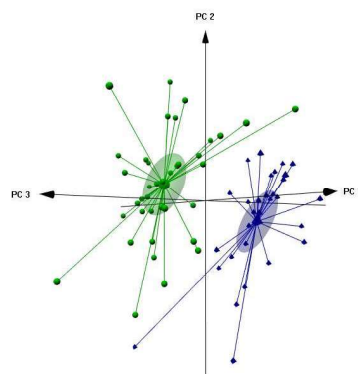


Figure 2 – E-nose-MOS performance: 3D PCA plot (PC1: 61%; PC2: 23%; and, PC3: 4%) regarding the unsupervised differentiation of "Côa" olive oils (green filled regions) and "Douro" olive oils (blue filled triangles), based on the average resistance response curves of the 9 MOS sensors comprised on the sensor device.

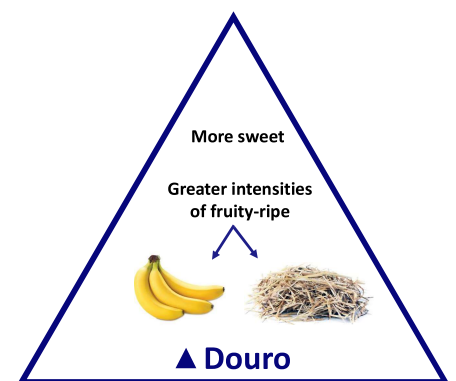


Figure 3 – Douro olive oil's attributes.

Conclusion

The E-nose could be used as an effective non-invasive tool to discriminate olive oils from two adjacent Portuguese geographical regions, which performance could be tentatively attributed to the different oils' olfactory profiles.

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